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Abstract # 123

CALIBRATION OF THE GEOSAR DUAL FREQUENCY INTERFEROMETRIC SAR

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Abstract:

GeoSAR is an airborne, interferometric Synthetic Aperture Radar (InSAR) system for terrain mapping, currently under development by a consortium including NASA's Jet Propulsion Laboratory (JPL), Calgis, Inc., and the California Department of Conservation (CalDOC) with funding provided by the Topographic Engineering Center (TEC) of the U.S. Army Corps of Engineers and the Defense Advanced Research Projects Agency (DARPA). The radar simultaneously maps swaths on both sides of the aircraft at two frequencies, X-Band and P-Band. For the P-Band system, data is collected for two across track interferometric baselines and at the crossed polarization. The aircraft position and attitude are measured using two Honeywell Embedded GPS Inertial Navigation Units (EGI) and an Ashtech Z12 GPS receiver. The mechanical orientation and position of the antennas are actively measured using a Laser Baseline Metrology System (LBMS). In the GeoSAR motion measurement software, these data are optimall!
y combined with data from a nearby ground station using Ashtech PNAV software to produce the position, orientation, and baseline information are used to process the dual frequency radar data.

Proper calibration of the GeoSAR system is essential to obtaining digital elevation models (DEMs) with the required sub-meter level planimetric and vertical accuracies. Calibration begins with the determination of the yaw and pitch biases for the two EGI units. Common range delays are determined for each mode, along with differential time and phase delays between channels. Because the antennas are measured by the LBMS, baseline calibration consists primarily of measuring a constant offset between mechanical center and the electrical phase center of the antennas. A phase screen, an offset to the interferometric phase difference which is a function of absolute phase, is applied to the interferometric data to compensate for multipath and leakage. Calibration parameters are calculated for each of the ten processing modes, each of the operational bandwidths (80 and 160 MHz), and each aircraft altitude.

In this talk we will discuss the layout calibration sites, the synthesis of data

from multiple flights to improve the calibration, methods for determing time and phase delays, and techniques for determining radiometric and polarimetric quantities. We will describe how calibration quantities are incorporated into the processor and pre-processor. We will demonstrate our techniques applied to GeoSAR data and assess the stability and accuracy of the calibration. This will be compared to the modeled performance determined from calibrating the output of a point target simulator. The details of baseline determination and phase screen calculation are covered in related talks.

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We look forward to seeing you in October 1999 in Toulouse for CEOS'99.

Kind Regards,

Maurice Borgeaud
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